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ABSTRACT

This paper provides a definition of interactive multimedia and explains why it is of interest to teachers and trainers, how it is produced and utilized, and how the role of teachers may be changed. It also offers recommendations for teacher trainers. Multimedia is defined as the combination of technologies such as computer text, video, audio, graphics, and animation, and it is argued that multimedia technologies offer unique opportunities to learners to access information by selecting highlighted words or icons. Choice of a word or icon enables the learner to select the order in which lessons are presented, skip unneeded lessons, access help screens, repeat a particular lesson, receive additional examples, or take a test. This ability to link items of related information in a non-linear fashion is known as hypermedia. It is noted that use of multimedia technology provides the opportunity for learning experiences that would otherwise be difficult for teachers to incorporate, such as computer simulations of dangerous chemical reactions and computer software that allows medical students to practice life-and-death procedures without harm to real patients. Research indicates that the use of multimedia technology results in significant changes in the teacher's role due to the increase in learner controlled instruction. It is recommended that teachers receive appropriate training in the use of multimedia technologies and their applications in the classroom. (17 references) (DB)

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Beyond Computer Literacy: How Can Teacher Educators Help Teachers Use Interactive Multimedia?

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by

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Introduction

Multimedia is one of the latest entries to join such favorite Instructional Technology "buzz words" as CAI, interactive video, hypertext, and expert systems. Some have claimed that multimedia will completely change how computers are utilized, while others view it as the beginning of a consolidation of the broadcast, publishing, and computer industries into one large communications industry (Fox, 1991). The purpose of this paper is to provide a definition of interactive multimedia, explain why it is of interest to teachers and trainers, explain how it is produced, how it is utilized, how the role of teachers may be changed, and offer recommendations for teacher trainers.

What is interactive multimedia?

Many advertisements for "multimedia" computers and "multimedia" software would have us believe that "multimedia" is a new, separate, and distinct technology. The truth is that multimedia can best be understood as the combination of various existing technologies. These technologies include computer text, full or still motion video, audio, graphics, and animation, which may be combined into a single interactive application.

What is the difference between multimedia and existing A-V technology?

While it is true that television, motion pictures and other audio-visual technologies can integrate text, graphics, sound and animation, they do so in a linear fashion. A student who watches an instructional television program, film, or video, does not usually have the capability to go back easily to previous instruction (trying to get a VCR to rewind to a particular frame can be a frustrating experience). If students wish to find out about a particular subject, get a definition, change the order of the instructions, or skip portions of the instruction altogether, they are generally out of luck. Most existing A-V technologies offer little more than rewinding, fast-forwarding and pausing. If computer-assisted instruction is to be utilized, the student must often switch back and forth between two different screens (computer and video), a confusing and time-consuming task.

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Multimedia technologies, on the other hand, offer unique opportunities for learners to access information by selecting highlighted words or icons, called "buttons." By selecting a certain button, a learner can receive a definition of a difficult term, select the order in which lessons are presented, skip unneeded lessons, access help screens, repeat a particular tutorial, receive additional examples or take a test. This ability to link items of related information in a non-linear fashion is known as Hypermedia.

In an "Interactive" lesson, learners become active participants, rather than passive observers, in the learning experience. They can become part of the program itself. They can exercise "learner control" over the sequence and content of the lesson (Kinzie, 1990).

Why should teachers and trainers be interested in multimedia?

Human beings are complex organisms, capable of thinking, dreaming, and communicating through various means, including imagery, sounds, and visual stimulation. Although we have so many ways by which we may learn, most of the instruction that we receive is delivered by text. This form of instruction utilizes little of our sensory mechanisms and only a small part of the brain's capability. By incorporating a full range of media, multimedia communicates and instructs on a more human-like level and offers a wider range of learning experiences, which, in turn, can reach a wider range of learners.

A recent article (Amthor, 1991) reminds us that people retain about 20% of what they hear, 40% of what they see and hear, and 75% of what they see, hear and do. Multimedia, which combines video, audio, and interaction, provides the best opportunity for retention. The more lifelike quality of interactive multimedia instruction, allows the learner to participate in realistic simulations that might prove too cost prohibitive or dangerous if performed in real life.

How is interactive multimedia produced?

Until recently, much of the technology needed to run a multimedia presentation was not available to the average computer user. High-end "multimedia" hardware and software were astronomically priced. Most personal computers did not have the speed or memory to handle complicated graphics or animation. Sound and full-motion video could take up enormous amounts of computer memory. To illustrate, one of the authors of this paper, after completing a short tutorial on perception, decided to "spice up" the presentation by adding a few seconds of music to introduce each new section. He was surprised to find that the addition of sound more than tripled the size of the tutorial.

Fortunately, faster computers with high resolution monitors, larger amounts of RAM, and large, speedy hard drives, can handle many multimedia projects. CD-ROM technology makes storage of vast amounts of information (up to 600 MB) available. Compression technology, such as Intel Corporation's Digital Video Interactive (DVI), makes audio and video much less memory-hungry. Microsoft, along with 11 other companies, has established a multimedia "standard" for personal computers and software (listed in Appendix 1), which is based upon the now-inexpensive 80286 computer.

On the software side, much of the work involved in the production of interactive multimedia presentations can be done by using programming tools, known as authoring programs. Authoring programs include Linkway, Quest, and Toolbook, for IBM-based systems, Hypercard and Supercard, for Macintosh-based systems, Authorware Professional for both IBM and Macintosh, and AmigaVision for the Commodore Amiga. These applications allow non-programmers (such as teachers and trainers) to develop and create computer-assisted instruction without having to learn a complicated computer language. In Authorware Professional, for instance, the developer simply chooses from several different icons (display, sound, animate, branch, etc.) and links them together into a flowchart-like "map."

The content of an interactive multimedia lesson may be gathered from a wide variety of sources, including the following:

1. Pictures and photographs may be scanned into the computer.
2. Presentation graphics programs, such as Harvard Graphics, Aldus Persuasion, or IBM Storyboard Live!, can be used to create animated sequences.
3. Drawing programs, such as Corel Draw, SuperPaint, and DrawPerfect can be used to create graphic images.
4. Computers with a Musical Instrument Digital Interface (MIDI) can take output from a musical instrument and convert it to computer code, which takes up much less memory than a digitized recording.
5. The authoring program can control videotape and videodisc players.

How is multimedia technology currently being utilized?

There are many exciting applications of multimedia technologies all across the country. The large storage capacity of CD-ROM technology has made it possible to store entire encyclopedias on compact discs, most of which feature sound, animation, graphics, full motion video and other attributes of multimedia. Four of the most notable multimedia encyclopedias are Grolier's Electronic Encyclopedia, Mammal's: A Multimedia Encyclopedia (National Geographic), The Video Encyclopedia of the 20th Century and Compton's Multimedia Encyclopedia.

Multimedia technology is also being utilized in higher education, where high quality simulations can enhance the learning process. A few examples are listed below:

1. A Harvard Law interactive video simulates hypothetical client cases without risking the well-being of an actual client.

2. The Chemistry curriculum at the University of Illinois includes interactive multimedia programs which allows students to formulate and test hypotheses and simulate chemical reactions, including dangerous reactions, in total safety (Smith & Jones, 1991).

3. Medical schools are using multimedia simulations to present symptoms of pathology for medical student diagnosis. This allows students to practice diagnostics without the threat of malpractice.

4. Several foreign language programs at major universities are utilizing interactive simulations to give students the opportunity to explore situations involving both language and culture in foreign countries (Gale, 1990).

How will these new technologies affect the role of teacher?

The changing of teachers' roles in light of the newest technologies is a familiar topic to those in the field of Instructional Technology. In fact, a recent ERIC search yielded over 100 references on the topic. Since then, a number of articles not on the ERIC list have been discovered by the authors of this paper. Many of these articles predict a shift in focus in the role of the teacher, from sole source of information to one of a manager of large information bases and a facilitator of learning experiences (ie. Fawson & Smellie, 1990). A recent report by one of the authors of this paper identifies over 60 different roles employed by teachers who use interactive technologies (Savenye, 1991). These role changes include the teacher becoming:

1. an instructional designer (Casteel & Johnson, 1989).
2. a creator of learning environments, particularly interactive learning environments (Swick, 1989, Vockell, 1989).
3. an organizer, controller and evaluator of student-centered learning (Simpson, 1984).
4. a user of various instructional delivery systems (Simpson, 1984).
5. a subject matter expert (teaching and learning) for interactive educational software development (Stager & Green, 1988; Stallard, 1982).

6. a developer of interactive computer materials, utilizing authoring programs and expert systems, rather than computer programming.
7. a user of computers and other technologies as instructional delivery systems/teaching tools (Zukowski, 1986).
8. a user of computers as administrative tools (Weller, 1983).

How can teacher educators help teachers use interactive multimedia?

If some or all of the above are roles which we expect teachers of the near future to fulfill, we may well ask, "How well are prospective teachers trained in these new roles during their preservice training?" Unfortunately, while most teachers today receive training in the role as a user of computers as administrative tools, too few receive adequate orientation in the other roles mentioned above.

Both authors of this paper have taught "Computers in Education" certification courses at major universities. These courses, and others like them, generally cover basic administrative functions, such as word processing, database management, grade rolls, and basic software evaluation. Many of the students, especially those who were older or who had little computer experience, were afraid of new technologies. They felt that they must be programmers or computer science majors to understand the functions and applications of new technologies.

Some introductory strategies, designed to reduce computer anxiety were utilized within an introductory Computers in Education course:

1. During the first day of class, students were brought into an auditorium. In front of the class was a Macintosh computer on a table which announced (using the MacTalker utility) that it was going to be their teacher for the semester and then confessed that the teacher was, in reality, sitting among them. Students were later allowed to experiment with MacTalker on their own.

2. Computers and other peripherals that were in the process of being repaired were brought into the class. Students were given a chance to see inside the computer, thus removing some of the "mystery" of the computer.

3. Students were encouraged to "play" and push buttons freely. They learned that there was no "self-destruct" button which would inevitably be pushed.

4. Overhead transparencies used during lecture sessions were replaced with Hypercard-based presentations, utilizing an LCD projection screen.

5. Lectures were given in the "technology classroom," which included computer projection, overhead/opaque projection, videodisc, videotape, and control of room lighting from a touch screen on the instructor's podium (Fawson & Van Uitert, 1990). Students were encouraged to view and operate the system.

6. Students were allowed to work on individualized projects (such as presentation graphics, computer tutorials, Hypercard, etc.).

Recommendations for Teacher Educators:

1. Prospective teachers can easily be scared away by the jargon of Instructional Technology (ie. instructional systems design, formative and summative evaluations, needs, job and task analyses, etc.) Teacher trainers must become "bilingual," ie. able to take the "tekkie" information and translate it into plain language and applications for practitioners.

2. Teachers must receive a broader computer base than simply the administrative uses of computers currently being taught. Teachers must also be trained in basic skills of instructional design--but not necessarily to memorize all of the steps of a Dick and Carey-type flowchart. A viable alternative to a dedicated course in instructional design is to teach I.D. concepts within existing computer literacy courses (Savenye, et al., 1990).

3. We cannot teach what we do not know. Teacher educators must keep current on applications of multimedia technologies. Look for examples of successful integration of multimedia technologies in journals and magazines, such as Tech Trends and T.H.E. Journal.

4. Even if we cannot teach in-depth multimedia applications because of time or unit constraints, we may still be able to introduce teachers to emerging technologies. Most teachers do not know where to begin. We can provide a brief introduction to various aspects of multimedia and let them know where to go from there (you may wish to assign individualized projects). You may even have students work on projects outside your expertise and have them teach you (or future classes) what they have learned.

5. Multimedia is expensive and carries certain hardware requirements. Start small, utilizing your current system. Start by adding one attribute at a time (graphics, audio, video, etc.) and work up from there.

6. Multimedia is interdisciplinary in nature and may involve many different personnel. Teacher educators should form cooperative alliances or user groups with media, telecommunications, library, and computing personnel in the school or district, as well as with other classroom teachers and even students. Many of these people will have resources to assist you.

7. Establish partnerships with business and industry, hardware and software vendors, and other educational institutions. Many vendors, such as Intel and IBM, provide on-site training for customers. Other companies, such as WordPerfect, Corp., license certain individuals to provide training in a specific geographic area. There may also be displays, discounts and funding available as a result of these partnerships.

Requests for reprints of this paper or further information can be directed to:

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Appendix 1
Multimedia PC Standards

Microsoft, along with an alliance of 11 hardware companies, has established a standard for multimedia-compatible computer systems that will allow for computer, peripheral, and software compatibility, similar in scope to VHS compatibility among videocassette recorders, players and tapes.

The MPC specification includes:

1. A 10 MHz or faster 286 or 386/486 CPU
2. 2 MB or more of RAM
3. 30 MB or larger hard disk drive
4. 4- or 8-bit VGA video display
5. A digital audio subsystem
6. A CD-ROM drive
7. Systems software compatible to the applications programming interface of Microsoft Windows 3.0

Appendix 2
Resource list

1. Applications of multimedia technology in the classroom:

T.H.E. Journal

Features sections on multimedia products and applications in every issue. Also distributes special issues on IBM and Macintosh technologies and an annual issue dealing specifically with multimedia.

Tech Trends

Published by the Association for Educational Communications and Technology. Free to AECT members. Features frequent articles on multimedia applications and products.

2. Multimedia Authoring Programs (a few of the most well-known):

IBM COMPATIBLE

Authorware Professional
Authorware
8500 Normandale Lake Blvd.
Ninth Floor
Minneapolis, MN 55437

Linkway
IBM Corporation
Educational System
P.O. Box 2150
Atlanta, GA 30055

Quest
Allen Communication
5225 Wiley Post Way
Salt Lake City, Utah 84116

Toolbook
Asymetrix Corp.
Bellevue, WA

MACINTOSH COMPATIBLE

Authorware Professional
Authorware
8500 Normandale Lake Blvd.
Ninth Floor
Minneapolis, MN 55437

Hypercard
Claris Corporation
Santa Clara, CA

Supercard
Silicon Beach Software